Chapter 6

How Cells Harvest Chemical Energy

Chapter Objectives

Opening Essay

Describe the main reactants and products of cellular respiration.

Cellular Respiration: Aerobic Harvesting of Energy

6.1 Compare the processes and locations of cellular respiration and photosynthesis. Explain why it is accurate to say that life on Earth is solar-powered.

6.2 Explain how breathing and cellular respiration are related.

6.3 Provide the overall chemical equation for cellular respiration. Compare the   
efficiency of this process in cells to the efficiency of a gasoline automobile   
engine.

6.4 Explain how the human body uses its daily supply of ATP.

6.5 Explain how the energy in a glucose molecule is released during cellular   
respiration.

6.5 Explain how redox reactions are used in cellular respiration.

6.5 Describe the general roles of dehydrogenase, NADH, and the electron transport chain in cellular respiration.

Stages of Cellular Respiration

6.6 List the cellular regions where glycolysis, the citric acid cycle, and oxidative phosphorylation occur. Note whether substrate-level phosphorylation or chemiosmosis occur at each of these sites.

6.7–6.12 Compare the reactants, products, and energy yield of the three stages of cellular respiration.

6.11 Explain how rotenone, cyanide, carbon monoxide, oligomycin, and uncouplers interrupt critical events in cellular respiration.

Fermentation: Anaerobic Harvesting of Energy

6.13 Compare the reactants, products, and energy yield of alcohol and lactic acid fermentation. Distinguish between strict anaerobes and facultative anaerobes.

6.14 Describe the evolutionary history of glycolysis.

Connections Between Metabolic Pathways

6.15 Explain how carbohydrates, fats, and proteins are used as fuel for cellular   
respiration. Explain why a gram of fat yields more ATP than a gram of starch or protein.

6.16 Explain how nutrients are used in biosynthesis.